

CLAIMS

1. A system, comprising:
a camera to obtain an image of a cargo space; and
an image evaluator to recognize lines within the image, and to evaluate
5 the lines for indications of cargo.
2. The system of claim 1, wherein the camera comprises an infrared
(IR) imaging device.
- 10 3. The system of claim 1, wherein the lines include straight lines or
curves.
4. The system of claim 1, wherein the indications are selected from
a group consisting of:
15 slope of at least one of the recognized lines;
change in brightness along at least one of the recognized lines; and
discontinuity in at least one of the recognized lines.
5. The system of claim 1, additionally comprising:
20 a projection pattern generator to trace a laser over a projection pattern
within the cargo space, wherein the projection pattern comprises the lines
within the image.
6. The system of claim 5, wherein the laser and the camera are
25 separately located to enhance the camera's perspective to view of slope of at
least one of the recognized lines.

7. The system of claim 1, additionally comprising:
an edge detection module to detect edges of surfaces defining the cargo
space, wherein the edges comprise the lines within the image.

5 8. The system of claim 1, additionally comprising:
a projection pattern image library comprising a projection pattern image;
and
wherein the image evaluator is configured to compare the image to the
projection pattern image.

10 9. A processor-readable medium comprising processor-executable
instructions for:
sensing lines within an image of a cargo space;
evaluating the lines; and
15 basing an indication of presence of cargo on the evaluation.

10 10. A processor-readable medium as recited in claim 9, wherein the
lines are formed by instructions for tracing a laser over a pattern within the
cargo space.

20 11. A processor-readable medium as recited in claim 9, wherein the
lines are formed by instructions for intersection of planes defining the cargo
space.

25 12. A processor-readable medium as recited in claim 9, wherein the
evaluating comprises instructions for:

measuring distances between lines within a projection pattern; and
determining if the measured distances indicate the presence of cargo.

13. A processor-readable medium as recited in claim 9, wherein the evaluating comprises instructions for measuring slope of lines within a projection pattern.

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14. A processor-readable medium as recited in claim 9, wherein the evaluating comprises instructions for reviewing lines within a projection pattern for breaks in continuity.

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15. A processor-readable medium as recited in claim 9, wherein the evaluating comprises instructions for measuring uniformity of brightness of lines within a projection pattern.

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16. A processor-readable medium comprising processor-executable instructions for:

forming a pattern within a cargo space using a laser;
obtaining an image of the pattern;
analyzing the image; and
basing an indication of cargo presence on the analysis.

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17. A processor-readable medium as recited in claim 16, wherein the forming comprises instructions for comparing the image to images within a projection pattern image library.

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18. A processor-readable medium as recited in claim 16, wherein the obtaining comprises instructions for operating a camera to capture the image.

19. A processor-readable medium as recited in claim 16, wherein the analyzing comprises instructions for:

measuring distances between lines within the pattern; and

5 determining if the measured distances indicate cargo presence.

20. A processor-readable medium as recited in claim 16, wherein the analyzing comprises instructions for recognizing a slope change, in a line within the pattern, indicating cargo presence.

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21. A processor-readable medium as recited in claim 16, wherein the analyzing comprises instructions for recognizing brightness change, in a line within the pattern, indicating cargo presence.

15 **22.** A processor-readable medium as recited in claim 16, wherein the analyzing comprises instructions for recognizing discontinuities, in a line within the pattern, indicating cargo presence.

23. A cargo sensing device, comprising:
means for defining a projection pattern within a cargo space;
means for obtaining an image of the projection pattern;
means for measuring distortion of the projection pattern within the
5 image; and
means for comparing the distortion to a threshold value.

24. The cargo sensing device of claim 23, wherein the means for
comparing is a means selected from a group consisting of:
10 means for recognizing slope of at least one of the recognized lines
indicating cargo presence;
means for recognizing change in brightness along at least one of the
recognized lines indicating cargo presence; and
means for recognizing discontinuity in at least one of the recognized
15 lines indicating cargo presence.

25. The cargo sensing device of claim 23, wherein the projection
pattern is defined by lines resulting from intersection of planes defining the
cargo space.

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26. The cargo sensing device of claim 23, wherein the means for
measuring distortion measures distances between lines within the projection
pattern.

25 27. The cargo sensing device of claim 23, wherein the means for
measuring distortion to the projection pattern recognizes discontinuities in lines
within the projection pattern.

28. The cargo sensing device of claim 23, wherein the means for measuring distortion compares the image of the projection pattern to images within projection pattern image library.

5 **29.** A method of determining cargo presence, comprising:
 defining a projection pattern within a cargo space;
 capturing an image of the projection pattern with a camera;
 evaluating lines within the projection pattern for evidence of cargo; and
 basing an indication of cargo presence on the evaluation.

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30. The method of claim 29, wherein the projection pattern is defined by tracing over a pattern repeatedly with a laser.

31. The method of claim 29, wherein the projection pattern is defined
15 by intersection of planes defining the cargo space.

32. The method of claim 29, wherein the evaluating comprises evaluating lines in the projection pattern for discontinuities.

20 **33.** The method of claim 29, wherein the evaluating comprises evaluating lines in the projection pattern for changes in brightness.

34. The method of claim 29, wherein the evaluating comprises evaluating lines in the projection pattern for changes in slope.

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35. The method of claim 29, wherein the evaluating comprises:
measuring distance between the lines within the projection pattern; and
determining if the measured distance is within a threshold of an
appropriate value.

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36. A method, comprising:
projecting an optical pattern within a cargo space; and
analyzing the optical pattern to determine whether cargo is present
within the cargo space.

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37. The method of claim 36, wherein the optical pattern is defined by
tracing with a laser.

38. The method of claim 36, wherein the analyzing comprises
15 detecting differences in brightness between parts of the optical pattern.

39. The method of claim 36, wherein the analyzing comprises
evaluating lines in the optical pattern for unexpected slopes.

20 40. The method of claim 36, wherein the analyzing comprises:
measuring distances between lines within the optical pattern; and
comparing the distances to an expected distance.

25 41. The method of claim 36, wherein the analyzing comprises:
detecting laser lines within the image; and
comparing the laser lines detected to a projection pattern image library.

42. The method of claim 36, wherein the analyzing comprises comparing the optical pattern to images within a projection pattern image library.

- 5 **43.** The method of claim 36, wherein the analyzing comprises comparing the optical pattern to a projection pattern image library comprising images of empty cargo areas and cargo-containing cargo areas.